

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re: Application of Hackbarth et al.

Confirmation No. 2641

Serial No. 10/796,681

Examiner: William K. Cheung

Filed: 03/09/2004

Art Unit: 1713

Title: UV-CURING ANTI-FINGERPRINTING COATINGS

**APPEAL BRIEF**

Mail Stop Appeal Brief - Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

This is an appeal of the Official Action dated November 1, 2007 rejecting all pending claims of the above-captioned patent application. The application has been rejected more than two times. For the reasons stated herein, the Examiner's rejection of the pending claims is improper and should be reversed.

The appellant filed a Notice of Appeal, under 35 U.S.C. § 134(a), in the above-identified application on May 1, 2008. An Appeal Brief was due July 1, 2008. Appellant submits this Appeal Brief under 37 C.F.R. §41.37 and respectfully submits that this Appeal Brief is timely filed under 37 C.F.R. §41.31, the time for filing having been extended by the accompanying Petition for Extension of Time. Appellant submits that the Appeal Brief meets the substantive requirements of §§41.31 and 41.37 and requests entry, consideration, and favorable action on this appeal. In accordance with §41.37 (c), the appellant presents the following items under the headings prescribed therein.

### **Real Party in Interest**

The real party in interest is Henkel AG & Co. Henkel Kommanditgesellschaft auf Aktien, the assignee of the inventors' entire interest, changed its name to Henkel AG & Co. in 2008. An assignment by the inventors to Henkel Kommanditgesellschaft auf Aktien has been recorded in the U.S. Patent and Trademark Office Assignment Division. A copy of the name change documents has not yet been recorded and will be supplied if required by the Board.

### **Related Appeals and Interferences**

Neither the assignee nor the appellant are aware of any other appeals or interferences that would bear on the Board's decision in this appeal.

### **Status of Claims**

Thirty-nine claims have been presented in this application.

Claims 1-7, 28 and 31-39 are currently pending in this application and stand rejected.

Claims 8-27 and 29-30 were the subject of a restriction requirement mailed December 28, 2004 and have been cancelled without prejudice.

Appellant hereby submits claims 1-7, 28 and 31-39 for appeal.

### **Grouping of Claims for Purposes of this Appeal Only**

- |            |                     |
|------------|---------------------|
| Group I:   | Claims 1-7          |
| Group II:  | Claims 28 and 31-35 |
| Group III: | Claims 36 and 37-39 |
| Group IV:  | Claim 39            |

### **Status of Amendments**

No amendments have been denied entry.

**Summary of Claimed Subject Matter**

The invention provides a coating material for metallic surfaces and a process for producing thin coatings from this material which are resistant to hydrolysis and to cleaning agents and are scratch resistant (Specification, page 3, line 30-34).

**Independent claim 1** recites: A coating material comprising:

- a. 40 to 90 wt.% (Specification, page 4, line 34-36) of at least one oligomeric substance selected from the group consisting of epoxy (meth)acrylates, polyester (meth)acrylates, polyether (meth)acrylates, and polyurethane (meth)acrylates, wherein said oligomeric substance is linear or branched (Specification, page 3, line 16-18) and contains at least two unsaturated double bonds (Specification, page 4, line 31-33 and page 14, Table 1, line 1-3, Examples 1-4 and 6-9);
- b. 5 to 60 wt.% of at least one low molecular weight (meth)acrylate selected from the group consisting of monofunctional, difunctional, trifunctional and polyfunctional (meth)acrylate compounds (Specification, page 3, line 19-21, page 5, line 1-4 and page 14, Table 1, line 4 & 5, Examples 1-9);
- c. 0.1 to 20 wt.% of at least one (meth)acrylate compound different from a and b containing one or more acidic groups (Specification, page 3, line 22-23 and page 14, Table 1, line 8 & 9, Examples 1-9); and
- d. 0.1 to 20 wt.% of at least one auxiliary substance selected from the group consisting of adhesion promoters different from c, flow-control agents, defoaming agents, light stabilizers, dyes, pigments, biocides, fillers and photoinitiators (Specification, page 3, line 26-29 and page 14, Table 1, line 10-13, Examples 1-9);

wherein 2.0 to 9.7 wt.% (Specification, Example 5, 6, 8, 9), based upon total coating material, of the at least one low molecular weight (meth)acrylate is selected from difunctional, trifunctional and polyfunctional (meth)acrylate compounds (Specification, page 5, line 10 and page 14, Table 1, line 5, Examples 5, 6, 8 and 9).

**Independent claim 28** recites: A coating material comprising:

- a. 45 to 85 wt.% (Specification, page 4, line 34-36) of at least one oligomeric substance having at least two unsaturated double bonds selected from the group consisting of epoxy (meth)acrylates, polyester (meth)acrylates, polyether (meth)acrylates, and polyurethane (meth)acrylates, wherein said oligomeric substance is linear or branched (Specification, page 3, line 16-18, page 4, line 31-33 and page 14, Table 1, line 1-3, Examples 1-9);
- b. 10 to 60 wt.% of at least one (meth)acrylate selected from the group consisting of monofunctional, difunctional, trifunctional and polyfunctional (meth)acrylate compounds (Specification, page 3, line 19-21, page 5, line 1-4 and page 14, Table 1, line 4 & 5, Examples 1-9);
- c. 0.5 to 10 wt.% of at least one (meth)acrylate compound containing one or more phosphoric or carboxyl acidic functional groups (Specification, page 6, line 22-27, page 14, Table 1, lines 8 & 9, Examples 1-9 and page 21, line 1-3);
- d. 0.5 to 15 wt.% of at least one radical photoinitiator (Specification, page 6, line 29-37 to page 7, line 9, page 14, Table 1, line 10 and footnote, and page 21, line 4); and
- e. up to 20 wt.% of at least one silane selected from the group consisting of dialkoxysilanes and trialkoxysilanes wherein said at least one silane contains at least one functional group other than alkoxy groups (Specification, page 6, line 10-17, page 14, Table 1, line 6 & 7, Examples 1-9 and page 21, line 6-10);

wherein 2.0 to 9.7 wt.% (Specification, Example 5, 6, 8, 9 ) based upon total coating material, of the at least one low molecular weight (meth)acrylate is selected from difunctional, trifunctional and polyfunctional (meth)acrylate compounds (Specification, page 5, line 10 and page 14, Table 1, line 5, Examples 5, 6, 8 and 9).

**Independent claim 36** recites: A high-energy radiation curable coating material for metal surfaces comprising:

- a. 40 to 90 wt.% (Specification, page 4, line 34-36) of a component of at least one oligomeric substance selected from aromatic epoxy (meth)acrylates, said at least one oligomeric substance optionally including at least one of polyester (meth)acrylates, polyether (meth)acrylates, and polyurethane (meth)acrylates, wherein said oligomeric substance contains at least two unsaturated double bonds (Specification, page 4, line 31-33 and page 14, Table 1, line 1-3, Examples 5, 6, 8, 9);
- b. 5 to 60 wt.% of a component of at least one low molecular weight (meth)acrylate selected from the group consisting of monofunctional, difunctional, trifunctional and polyfunctional (meth)acrylate compounds different from a (Specification, page 3, line 19-21, page 5, line 1-4 and page 14, Table 1, line 4 & 5, Examples 1-9);
- c. 0.1 to 20 wt.% of a component of at least one (meth)acrylate compound different from a and b containing one or more acidic groups (Specification, page 3, line 22-23 and page 14, Table 1, line 8 & 9, Examples 1-9); and
- d. 0.1 to 20 wt.% of a component of at least one auxiliary substance selected from the group consisting of adhesion promoters, flow-control agents, defoaming agents, light stabilizers, dyes, pigments, biocides, fillers and photoinitiators (Specification, page 3, line 26-29 and page 14, Table 1, line 10-13, Examples 1-9);

wherein said components are selected and homogenized (Specification, page 13, line 6-9) such that the coating material has a viscosity of less than 1000 mPas within a temperature range of 0 to 90°C and the coating material deposited on metal surfaces cross-links to become a formable surface coating upon curing (Specification, page 3, line 9-34).

**Independent claim 39** recites: A coating material comprising:

- a. 40 to 90 wt.% (Specification, page 4, line 34-36) of at least one oligomeric substance selected from the group consisting of epoxy (meth)acrylates, polyester (meth)acrylates, polyether (meth)acrylates, and polyurethane (meth)acrylates, wherein said oligomeric substance is linear or branched (Specification, page 3, line 16-18) and contains at least two unsaturated double bonds (Specification, page 4, line 31-33 and page 14, Table 1, line 1-3, Examples 1-4 and 6-9);
- b. 5 to 60 wt.% of at least one low molecular weight (meth)acrylate selected from the group consisting of monofunctional, difunctional, trifunctional and polyfunctional (meth)acrylate compounds (Specification, page 3, line 19-21, page 5, line 1-4 and page 14, Table 1, line 4 & 5, Examples 1-9);
- c. 0.1 to 20 wt.% of at least one (meth)acrylate compound different from a and b containing one or more acidic groups and comprising at least one methacrylate compound selected from the group consisting of phosphoric (meth)acrylate compounds and phosphonic (meth)acrylate compounds (Specification, page 3, line 22-23, page 6, lines 19-27 and page 14, Table 1, line 9, Examples 5, 8, 9); and
- d. 0.1 to 20 wt.% of at least one auxiliary substance selected from the group consisting of adhesion promoters different from c, flow-control agents, defoaming agents, light stabilizers, dyes, pigments, biocides, fillers and photoinitiators (Specification, page 3, line 26-29 and page 14, Table 1, line 10-13, Examples 1-9);

wherein 2.0 to 15.4 wt.% (Specification, page 14, Table 1, line 5, Example 1, 2, 5, 6, 8, 9), based upon total coating material, of the at least one low molecular weight (meth)acrylate is selected from difunctional, trifunctional and polyfunctional (meth)acrylate compounds (Specification, page 5, line 10 and page 14, Table 1, line 5, Examples 5, 6, 8 and 9).

**Grounds of Rejection to be Reviewed on Appeal**

1. Claims 1-7, 28, 31-35 and 37-39 stand rejected under 35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement.
2. Claim 36 stands rejected on unspecified grounds.
3. Claims 1-3 and 5 stand rejected under 35 U.S.C. 102(b) as being anticipated by Shustack (US 5,128,391).
4. Claim 4 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Shustack (US 5,128,391) in view of Shustack (US 5,128,387).
5. Claim 6 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Shustack (US 5,128,391) in view of Razavi (US 5,629,365).
6. Claims 28, 31-35 and 37-39 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Shustack (US 5,128,391).

**The Invention**

Appellants' invention is directed to a coating material and a method of producing a coating on metal substrates, such as stainless steel and aluminum metal coils and sheets, which are then shaped into various products such as kitchen appliances, hospital equipment and architectural articles. The coating produced is desirably adherent to the metal, is formable, resistant to solvent, fingerprints, food stains, scratching and corrosion and is preferably clear so as to allow polished or patterned surfaces of the metal to show. The composition of the coating material must be carefully selected to produce these features, balancing hardness for scratch resistance with toughness for formability (Specification, page 2, line 28 to page 3, line 8). Appellants met these challenges with the claimed compositions.

**Argument****A. Claims 1-7, 28, 31-35 and 37-39 meet the written description requirement under 35 U.S.C. §112, first paragraph**

Claims 1-7, 28, 31-35 and 37-39 were erroneously rejected under 35 U.S.C. §112, first paragraph, as lacking support in the specification, based on an incorrect interpretation of the term “(meth)acrylate” by the Examiner. Specifically, the Examiner concluded that the examples, all of which use acrylate resins, do not support the term “(meth)acrylate” in the claims, despite evidence in the specification to the contrary.

**1. No *prima facie* case for denying patentability under 35 U.S.C. §112, first paragraph has been established.**

In rejecting claims 1-7, 28, 31-35 and 37-39, the Examiner stated that the examples relied upon by Applicants “does not disclose any (meth)acrylate compound; the table only disclose acrylate compounds”. (Official Action mailed Nov. 1, 2007, page 3, paragraph 2).

The initial burden of establishing a *prima facie* basis to deny patentability to a claimed invention on any ground is always upon the examiner. Adequate description under 35 U.S.C. §112, first paragraph does not require verbatim support for the claimed invention. Rather, it is sufficient if the originally-filed disclosure would have conveyed to one having ordinary skill in the art that Appellant had possession of the concept of what is claimed. *Ex Parte Parks*, 30 USPQ2d 1234 (1993).

One of ordinary skill in the art reading the specification would understand Appellants’ usage of the term “(meth)acrylate” to mean “acrylate or methacrylate” and would recognize that Appellants had indeed made a composition that falls within the claims.

In the Detailed Description portion of the specification, suitable substances for use in the claimed composition are described as “(meth)acrylate”, “acrylate” and “methacrylate” (Specification, page 4, line 25-31, page 5, line 1 to page 6, line 8). The specification uses “acrylate” and “methacrylate” with “(meth)acrylate” as follows:



The following (meth)acrylates are examples of monofunctional acrylate compounds which can be used: linear, branched or cyclic alkyl (meth)acrylates, ... (Specification, page 5, line 24-26).

...It may be advantageous to disperse these components in portions of the liquid acrylate compounds prior to addition to the coating material. (Specification, page 7, line 35-37).

Preferably, the coating materials are to contain methacrylate compounds which have acidic groups and contain one, two or more (meth)acrylic groups and in addition acidic functional groups. (Specification, page 6, line 19-22).

This usage is not incorrect or even unusual in resin chemistry. Those of skill in the art know that the ordinary usage of the term "(meth)acrylate" in the coatings industry encompasses both acrylates that are substituted with a methyl group (i.e. methacrylates) and those that are not substituted (i.e. acrylates). Appendix B contains a list of quotes from numerous United States Patents which use various forms of the "(meth)acryl-" term to describe acrylate or methacrylate.

Chemical dictionaries likewise identify these terms as synonyms:

Acrylate Resins. See Acrylic Resins.

Acrylic Resins. Polymers of acrylic or methacrylic esters, sometimes modified with non-acrylic monomers, such as the ABS group...

....

Methacrylate Plastics. See Acrylic Plastics.

Methacrylic Acid. A colorless liquid monomer used in the production of many types of acrylic resins.

Whittington, Lloyd R., *Whittington's Dictionary of Plastics*, 1<sup>st</sup> Edition 1968, pp. 4 & 151, Society of Plastics Engineers, Inc., Technomic Publishing Co., Inc.

Acrylic Resin. Thermoplastic polymers and copolymers of acrylic acid, methacrylic acid, esters of these acids, or acrylonitrile....

Methacrylate Resin. See acrylic resin.

Methacrylic acid. ....

See acrylic resin.

*Hawley's Condensed Chemical Dictionary*, 12<sup>th</sup> Ed. 1993, Van Nostrand Reinhold Co., pp. 19 & 749-750.

(See Appendix B for copies of relevant pages of these dictionary references.)

The foregoing evidence from the public domain shows that the Examiner has made an

overly narrow interpretation of the meaning of “(meth) acrylate” that is contrary to the understanding of those of skill in the art.

Additional facts support Appellants’ interpretation of “(meth)acrylate”. It is well known that one purpose of the examples in a chemical patent application is to evidence reduction to practice of the claimed invention. In the instant application, the term “(meth)acrylate” is not found **anywhere** in the examples (Specification, pages 13-16). Instead, each of Raw Material Nos. 1-5, 8 and 9 are identified as “acrylates”, “diacrylates” or “triacylates” (Specification, page 14, Table 1, line 1-5, 8 and 9). This recitation of the actual experimental conditions does not read “(meth)acrylate” because Appellants were describing specific experiments made. To conclude that Appellants conducted each and every one of their examples using “acrylate” and then determined to describe and claim only acrylates substituted with a methyl group, namely “methacrylates”, makes no sense. Clearly, one’s own examples should not **all** be outside the scope of the rest of the specification.

The meaning intended by Appellants for the term “(meth)acrylate” is shown, for example, by the recitation in the examples of “isobornyl acrylate” (Specification, page 14, Table 1, line 4), as compared to the term in the specification recited as “isobornyl (meth)acrylate” (Specification, page 5, line 30).

One of skill in the art looking at the examples and reading the specification as a whole would understand that the parenthesis added to “methacrylate” to make it “(meth)acrylate” serves as shorthand for “acrylate or methacrylate”. The rejection of claims 1-7, 28, 31-35 and 37-39 under 35 U.S.C. §112, first paragraph should be reversed.

#### **Independent Claims 1 and 28, and their dependent claims, and Claim 38**

The Examiner has failed to establish a *prima facie* case of lack of support in the specification for the phrase “2.0 to 9.7 wt.%, based upon total coating material, of the at least one low molecular weight (meth)acrylate is selected from difunctional, trifunctional and polyfunctional (meth)acrylate compounds” contained in independent claims 1 and 28, their dependent claims, and claim 38. Examples 5, 6, 8, and 9 show that Appellants had possession of

the claimed invention, where each of these examples contained "neopentyl glycol propoxylate diacrylate" a difunctional (meth)acrylate compound in amounts meeting the claim feature 2.0% (Example 8), 2.1% (Examples 6 and 9) and 9.7% (Example 5). (See Specification, page 14, Table 1 and the Table below which is reproduced from Appellants' Response of August 8, 2007).

As discussed above, one of ordinary skill in the art reading the term "(meth)acrylate" would understand that this term includes acrylates or methacrylates. As shown in the below table, all of the examples that Appellants put in the application to evidence their invention are acrylates. With these examples in the specification, if Appellants were differentiating between acrylates and methacrylates, the discussion would cry out for the mention of same, see *Ex Parte Parks*, supra.

A specification may describe an actual reduction to practice by showing that the inventor constructed an embodiment or performed a process that met all the limitations of the claim and determined that the invention would work for its intended purpose. *Cooper v. Goldfarb*, 154 F.3d 1321, 1327, 47 USPQ2d 1896, 1901 (Fed. Cir. 1998). Appellants herein made embodiments that meet all the limitations of independent claim 1 and 28. The test results from Table 2 of the specification show that the embodiments work for their intended purposes.

Based upon each of the foregoing arguments, Appellant submits there is adequate support for the phrase "2.0 to 9.7 wt.%, based upon total coating material, of the at least one low molecular weight (meth)acrylate is selected from difunctional, trifunctional and polyfunctional (meth)acrylate compounds" in the specification.

### **Independent Claim 39**

Likewise, the Examiner has failed to establish a *prima facie* case of lack of support in the specification for the phrase "2.0 to 15.4 wt.%, based upon total coating material, of the at least one low molecular weight (meth)acrylate is selected from difunctional, trifunctional and polyfunctional (meth)acrylate compounds" contained in independent claim 39. Examples 5, 6, 8, and 9 show that Appellants had possession of the claimed invention, where each of these examples contained "neopentyl glycol propoxylate diacrylate" a difunctional (meth)acrylate

compound in amounts meeting the claim feature 2.0% (Example 8), 2.1% (Examples 6 and 9) and 15.4% (Example 1 and 2). (See Specification, page 14, Table 1 and the Table in Section A.2. below). Arguments made regarding claims 1 and 28 are incorporated by reference with regard to support for claim 39. As such, Appellant submits there is adequate support for the phrase "2.0 to 15.4 wt.%, based upon total coating material, of the at least one low molecular weight (meth)acrylate is selected from difunctional, trifunctional and polyfunctional (meth)acrylate compounds" in the specification.

### **Dependent Claim 37**

Claim 37 depends from independent claim 36; the independent claim was not rejected under 35 U.S.C. §112, first paragraph. The initial burden of establishing a *prima facie* basis to deny patentability to a claimed invention on any ground is always upon the examiner. The Examiner did not address the reasons for the rejection of claim 37 under 35 U.S.C. §112, first paragraph. No notice was provided as to what terms were lacking support in the specification; this is improper and requires reversal.

Notwithstanding the foregoing, claim 37 recites that component (a) comprises 34.3 to 80.8 wt% aromatic epoxy (meth)acrylates, which amounts were drawn from the examples and Table 1 of Appellants' specification. For the reasons set forth above with respect to the independent claims, Appellants submit that there is adequate support in the specification for claim 37 to satisfy all requirements under 35 U.S.C. §112, first paragraph. The rejection of claim 37 should be reversed on substantive as well as procedural grounds.

Claims 1-7, 28, 31-35 and 37-39 meet the written description requirement under 35 U.S.C. §112, first paragraph and the rejection must be reversed.

### **2. The Final Rejection of claims 1-7, 28, 31-35 and 37-39 must be reversed where the Examiner failed to meet the requirements of MPEP 2163.04, Section II.**

The Final Rejection of claims 1-7, 28, 31-35 and 37-39 under §112, first paragraph must be reversed where Appellant provided a further showing of support for the rejected claim features

in the Response dated August 8, 2007 and the Examiner did not follow the requirements of MPEP 2163.04-“Burden on the Examiner with Regard to the Written Description Requirement”.

Section II of MPEP 2163.04 states:

Upon reply by applicant, before repeating any rejection under 35 U.S.C. 112, para. 1, for lack of written description, review the basis for the rejection in view of the record as a whole, including amendments, arguments, and any evidence submitted by applicant. If the whole record now demonstrates that the written description requirement is satisfied, do not repeat the rejection in the next Office action. If the record still does not demonstrate that the written description is adequate to support the claim(s), repeat the rejection under 35 U.S.C. 112, para. 1, fully respond to applicant's rebuttal arguments, and properly treat any further showings submitted by applicant in the reply. MPEP 2163.04, Section II (emphasis added).

In rejecting Appellants' showing of support, the Examiner stated:

Applicants argue that the claimed concentration is supported by Table of page 8 of applicants response filed August 8, 2007. However, applicants fail to recognize that the Table in page 8 does not disclose any (meth)acrylate compound; the table only disclose acrylate compounds. (Official Action mailed Nov. 1, 2007, page 3, paragraph 2).

The “Table of page 8”, referred to by the Examiner, is a copy of Table 1 from page 14 of the specification with addition of a calculation of total parts by weight of the examples and the weight percent of neopentyl glycol propoxylate diacrylate. It is reproduced hereafter:

<b>Total Parts by weight</b>		<b>130.0</b>	<b>130.0</b>	<b>105.0</b>	<b>115.0</b>	<b>103.0</b>	<b>100.0</b>	<b>105.0</b>	<b>100.0</b>	<b>100.0</b>
Example/Raw Material		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>
1	Aliphatic epoxy acrylate	61.9	-	-	-	-	-	-	-	-
2	Aliphatic hexa-functional urethane acrylate $M_w$ 1000	-	56.9	56.9	56.9	-	34.0	56.9	31.5	31.6
3	Aromatic epoxy diacrylate $M_w$ 460	-	-	-	-	80.8	37.0	-	34.3	34.5
4	Isobornyl acrylate	30.6	35.1	35.1	35.1	-	21.1	35.1	19.4	19.5
5	Neopentyl glycol propoxylate diacrylate	20.0	20.0	-	-	10.0	2.1	-	2.0	2.0
6	Vinyltrimethoxy-silane	-	-	5.0	15.0	-	-	5.0	-	-
7	Bis(gamma-trimethoxysilylpropyl)amine	10.0	10.0	-	-	4.2	1.0	-	0.9	0.8
8	Acid triacrylate (acid value 150)	2.5	3.0	3.0	3.0	-	1.8	3.0	1.7	1.7
9	Phosphoric acid acrylate (acid value 300)		-	-	-	3.0	-	-	2.8	2.8
10	Photoinitiator	5.0	5.0	5.0	5.0	5.0	3.0	4.5	4.6	4.7
11	Commercial biocide	-	-	-	-	-	-	0.5	-	-
12	Hydrophobic silica	-	-	-	-	-	-	-	2.8	-
13	Nanoparticulate $Al_2O_3$									2.4

Example 1 is 15.4%, Example 2 is 15.4%, Example 5 is 9.7%, Example 6 is 2.1%, Example 8 is 2.0% and Example 9 is 2.1%.

Appellants submit that the Examiner did not fully respond to the rebuttal arguments and further showings of support in Appellants' reply. The fact that all of Appellants' examples are reductions to practice of compositions of "acrylates" and the specification refers to "acrylates" as "(meth)acrylates" and "methacrylates" as having "(meth)acrylate" groups should have been addressed. As such, the finality of this rejection should be reversed.

Appellant respectfully requests the reversal of the rejection of Claims 1-7, 28, 31-35 and 37-39 under 35 U.S.C. §112, first paragraph for the reasons set forth above.

**B. The rejection of claim 36 is improper where there are no outstanding grounds of rejection provided by the Examiner**

Independent claim 36 was added in the amendment filed January 19, 2007. This claim was rejected under 35 U.S.C. §112, **second** paragraph in the Official Action mailed February 8, 2007. Appellants amended claim 36 on August 8, 2007 and the 35 U.S.C. §112, second paragraph rejection was withdrawn in the Official Action mailed November 1, 2007.

The Office Action Summary sheet of the Official Action mailed November 1, 2007 shows that claims 1-7, 28 and 31-39 are finally rejected. However, no ground of rejection for claim 36 has been provided. The rejection of claim 36 must be reversed.

**C. The rejection of claims 1-3 and 5 under 35 U.S.C. §102(b) as anticipated by US Patent No. 5,128,391 to Shustack must be reversed where all features of the claimed invention are not taught by the reference**

The Examiner rejected independent claim 1, and claims 2, 3 and 5 depending therefrom, stating:

The prior art to Shustack (abstract) relates to an extensible and pasteurizable radiation curable coating for metal. The ingredients in the coatings are (a) 15-75 wt% of ethylenically unsaturated monomer as defined by a general formula disclosed at column 2, line 45-60, and column 5, line 29-65, which meets the instantly claimed component (b);....  
(Official Action mailed Nov. 1, 2007, page 4, paragraph 2-3).

The cited passages in the '391 reference are limited to **monofunctional** monomers in amounts of **15-75 wt%**.

In contrast, claim 1 requires that **at least a portion of component (b) must be difunctional, trifunctional or polyfunctional** stating: "2.0 to 9.7 wt.%, based upon total coating material, of the at least one low molecular weight (meth)acrylate is selected from difunctional, trifunctional and polyfunctional (meth)acrylate compounds".

When Appellants pointed this feature out to the Examiner, the Examiner relied upon a generic catch-all statement in the '391 reference, permitting one to add practically any monomer

to the mix as an **additive not considered in the amounts of the basic composition**, that is, as a separate component:

Applicant's arguments filed August 8, 2007 have been fully considered but they are not persuasive. Applicants argue that Shustack does not disclose any (meth)acrylate di-functional or tri-functional compounds. However, the examiner disagrees because Shustack (col. 12, line 18-19) clearly disclose the use of multifunctional (meth)acrylates.  
(Official Action mailed Nov. 1, 2007, page 5, last paragraph).

The passage relied upon by the Examiner to meet **component (b)** states:

Additionally, numerous other mono- or multifunctional monomers which are compatible with the basic composition may be incorporated therein, in an amount of up to 30% by weight of the basic composition, insofar as they do not adversely affect the composition. Examples of such compatible monomers are vinylic compounds such as acrylamide, acrylamide derivatives, vinyl pyrrolidone and other mono- or multi-functional acrylates and/or methacrylates such as glycerol propoxy triacrylate or trimethylol propane propoxylate triacrylate. (US Patent No. 5,128,391, col. 12, lines 11-21).

This same phrase in the '391 reference is relied upon by the Examiner to meet **component (c)**:

Shustack further teaches that the numerous other mono-multifunctional monomers, which are compatible with the basic composition may be included therein, in an amount of up to 30 wt% (column 12, line.11-21), which meets the instantly claimed component (c)....  
(Official Action mailed Nov. 1, 2007, page 4, last paragraph).

Component (c) of claim 1 recites: "0.1 to 20 wt.% of at least one (meth)acrylate compound different from a and b containing one or more acidic groups".

A rejection under 35 U.S.C. §102 can only be maintained if a single reference teaches each and every element of the claims. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). It is well settled that to be anticipatory, a reference must put the invention in the hands of the public. Specifically, "[a]nticipation requires the disclosure in a single prior art reference of each element of the claim under consideration." *W.L. Gore & Assoc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983). Appellants submit that



the above language from the '391 reference does not put the combination of each element, and the amount thereof, recited in claim 1 into the hands of the public.

The same generic disclosure of any monomer in amounts of up to an additional 30 wt.% cannot be said to unambiguously disclose both component (b) and (c) in the claimed amounts in a manner sufficient to enable the invention of claim 1. As such, the rejection of claims 1-3 and 5 under 35 U.S.C. §102(b) as anticipated by US Patent No. 5,128,391 to Shustack must be reversed.

- D. **The rejection of claim 4 under 35 U.S.C. §103(a) as being unpatentable over Shustack (US 5,128,391) in view of Shustack (US 5,128,387) must be reversed where the proposed combination of these references is improper**

The Examiner erred in attempting to modify the '391 reference using features of the '387 reference that were specifically criticized by the '391 reference.

Claim 4 depends from claim 1, and recites the additional feature of component c) comprising at least one methacrylate compound selected from phosphoric (meth)acrylate compounds and phosphonic (meth)acrylate compounds. The '391 reference fails to teach or suggest the claimed acidic compounds. The following passage from '391 reference, is part of the Description of the Preferred Embodiments and teaches against using acidic adhesion promoters:

The organofunctional silane adhesion promoters of this invention are particularly advantageous inasmuch as they allow the incorporation of these amine coinitiators in the composition. Unlike the acidic adhesion promoters disclosed in the Shustack application U.S. Ser. No. 134,975, filed Dec. 18, 1987, particular non-acidic silanes can be chosen such that, if it is desired to use an amine coinitiator, there is a reduced tendency for the chosen non-acidic silanes to react with the amine, thus rendering the adhesion promoter ineffective and possibly compromising formation stability through premature gelling. (US 5,128,391, Col. 10, lines 51-62, emphasis added).

The application, U.S. Ser. No. 134,975, filed Dec. 18, 1987, criticized in the above passage is the parent of US Patent No. 5,128,387, which the Examiner seeks to combine with the '391 reference to meet Appellants' claims.

The '391 reference unambiguously teaches away from use of acidic components as

incorporating them risks “compromising formation stability through premature gelling”. One of ordinary skill in the art, reading these teachings would be led away from acidic components due to the gelling problems cited in the primary reference.

In maintaining the rejection, the Examiner stated:

Applicants argue that the prior art of Shustack et al. are silent on “at least one (meth)acrylate compound containing one or more acidic groups” and that Shustack et al. teach away from the claimed invention because Shustack et al. (col. 2, line 17-36) would cause undesirable effect, such as premature gelling. However, the examiner disagrees, because applicants’ cited teaching is related to the background or the related art of the disclosed invention. Such background teaching does not constitute as negative teachings of the applicants’ instantly claimed invention because Shustack et al (col. 7, line 52-68) clearly indicate that when acid functional group containing compound is used, Novacure 3800 (an initiator) should be used to avoid the incompatibility issues dealing with the neutralization of the acid group containing compound with an amine group containing initiation system.

(Official Action mailed Dec. 20, 2005, page 4, paragraph 4 to page 5, paragraph 1).

The Examiner’s conclusion is erroneous for two reasons. First, the above-quoted Description of Preferred Embodiments of the ‘391 reference teaches against using acidic components. Second, the Examiner has incorrectly characterized “Novacure 3800” as an initiator.

In the “Response to Arguments” of the Official Action dated February 2, 2007, the Examiner agreed that “Novacure 800” is an epoxy acrylate oligomer, not an initiator. The Examiner appears to have been referring to Novacure 3800, since Novacure 800 does not appear to be found in the references. Appellant submits that in view of the nature of Novacure 3800, the Examiner’s argument that “Shustack et al (col. 7, line 52-68) clearly indicate that when acid functional group containing compound is used, Novacure 3800 (an initiator) should be used to avoid the incompatibility issues dealing with the neutralization of the acid group containing compound with an amine group containing initiation system” is unfounded.

The Shustack references (the ‘391 and ‘387 references) do not clearly indicate that when acid functional group containing compound is used, Novacure 3800 (an initiator) should be used to avoid the incompatibility issues. First, Novacure 3800 is an epoxy acrylate oligomer, it is not

an initiator. Second, claim 1 specifically recites epoxy (meth)acrylate oligomers as part of component "a" and separately recites "at least one (meth)acrylate compound different from a and b containing one or more acidic groups" that is part of component "c".

Shustack (US 5,128,391) is an improvement over the prior Shustack reference ('387) and uses the organofunctional silane adhesion promoters as substitutes for acidic adhesion promoters, due to problems with compromising formation stability through premature gelling. One of skill in the art reading the '391 reference would understand that other acidic components could also cause gelling and would be led away from using them. Seeking to combine the two Shustack references is improper where doing so destroys the '391's teachings. The '391 specifically teaches that acidic compositions are not to be used because they react with the amine groups. The '387 is being relied upon by the Examiner to teach adding the very chemicals that the '391 teaches are to be avoided. As such, the combination of these references would destroy the '391 and thus cannot be used to support a rejection under 35 U.S.C. §103. The rejection of claim 4 should be reversed.

**E. The rejection of claim 6 under 35 U.S.C. §103(a) as being unpatentable over Shustack (US 5,128,391) in view of Razavi (US 5,629,365) must be reversed where there is no teaching, suggestion or motivation to modify the primary reference according to the secondary reference**

Claim 6 depends from claim 1 and recites the added feature of a biocide. The Examiner erred in seeking to modify the '391 reference by adding biocide as taught by the '365 reference where one of ordinary skill in the art would not have been motivated to combine the references and, further, would have been de-motivated to add biocide the '391 coatings.

The '391 reference is directed to radiation curable coatings composition, that is, compositions that react upon exposure to radiation (US Patent No. 5,128,391, col. 2, line 34). In contrast, the '365 reference is directed to a polymeric lattice containing colloidal particles of UV-absorbing polymer suspended in a substantially aqueous medium (US Patent No. 5,629,365, col. 2, line 40-47) that prevent reactions by absorbing the radiation. There is no teaching or suggestion of the absorbing polymers of the '356 patent being reactive upon exposure to UV

radiation. In fact, the '365 reference teaches using the UV absorbing polymer lattices as "sunscreens" to protect UV-reactive polymers such as acrylic resins (US Patent No. 5,629,365, col. 7, line 59-61). One of ordinary skill in the art, seeking to make a coating that reacts by UV radiation would certainly not look to the '365 reference which is directed to impairing UV induced reactions.

Furthermore, the coatings taught by the '391 reference are for metal containers, such as beverage cans, which coatings must withstand pasteurization (US Patent No. 5,128,391, col. 3, line 17-26). Pasteurization is known in the art to be used for food, such as milk and baby formula. There is no teaching or suggestion that the '365 reference compositions are suitable for pasteurization or food contact. One of ordinary skill, understanding that pasteurization is used for food, would not look to the '365 patent with uses directed to "coatings on UV-susceptible substrates" for example "as a UV barrier on glass or plastic windows, display cases and containers" (US Patent No. 5,629,365, col. 2, line 17-29).

Finally, even if one were to consider the '365 reference as a possible source to modify the '391 reference, one of skill in the art interested in improving coating materials that will be pasteurized will have the common sense to consider the products that will contact the coating during and after pasteurization, namely food. The person of ordinary skill, and good sense, would be motivated to avoid addition of "biocide" to the compositions of the '391 reference where food contact with biocides is generally not acceptable.

Considering the foregoing, it would not have been obvious to one of ordinary skill in the art at the time the invention was made to modify the cross-linkable composition of the '391 patent by the teachings of the '365 reference in order to add biocide. As such, the rejection of claim 6 under 35 U.S.C. §103 should be reversed.

- F. The rejection of claims 28, 31-35 and 37-39 under 35 U.S.C. §103(a) as being unpatentable over Shustack (US 5,128,391) must be reversed where all features of the claimed invention are neither taught nor suggested by the reference .**

**Independent claims 28, and dependent claims 31- 35**

Claim 28, and claims 31-35 depending from claim 28, recite "2.0 to 9.7 wt.%, based upon total coating material, of the at least one low molecular weight (meth)acrylate is selected from difunctional, trifunctional and polyfunctional (meth)acrylate compounds". For the reasons recited above regarding patentability of claim 1 over the references, incorporated herein by reference, Appellants submit that the Examiner erred in rejecting claim 28 as obvious over the '391 reference.

The '391 reference is directed to coating aluminum cans for later pasteurization. One of ordinary skill in the art seeking to coat metal coil for use in appliances and architectural products, neither of which are pasteurized, would not look to food canning technologies. Even if a person of skill looked to the '391 reference, there is no teaching or suggestion in the '391 that would motivate one of skill in the art to make the many modifications to the '391 reference required to achieve Appellants' claim 28. There is no motivation to select the particular "difunctional, trifunctional and polyfunctional (meth)acrylate compounds" having "low molecular weight" in the amount of "2.0 to 9.7 wt.% of the total composition" from the generic teachings provided by the '391 reference. The distinctions between claim 1 and the '391 reference made above are equally applicable regarding claim 28. The rejection should be reversed.

Claim 28 further recites "0.5 to 10 wt.% of at least one (meth)acrylate compound containing one or more phosphoric or carboxyl acidic functional groups" and claim 31 recites "component c) comprises at least one methacrylate compound selected from the group consisting of phosphoric (meth)acrylate compounds and phosphonic (meth)acrylate compounds". As discussed with respect to claim 4, above, the '391 patent does not teach acidic components and in fact teaches against acidic adhesion promoters due to gelling problems. For the reasons set forth above regarding nonobviousness of claim 4 over the '391 reference, incorporated herein by

reference, Appellants submit that there is no teaching or suggestion in the '391 that would motivate one of skill in the art to modify the reference in an attempt to achieve Appellants' claim 28 or 31. The rejection should be reversed.

#### **Independent claim 39**

Independent claim 39 recites "2.0 to 15.4 wt.%, based upon total coating material, of the at least one low molecular weight (meth)acrylate is selected from difunctional, trifunctional and polyfunctional (meth)acrylate compounds". As discussed above, these features are supported by Table 1 of the specification and are outside the amounts taught by the '391 reference. For the reasons recited above regarding patentability of claim 1 over the references, incorporated herein by reference, Appellants submit that there is no teaching or suggestion in the '391 that would motivate one of skill in the art to modify the reference in an attempt to achieve Appellants' claim 39. The rejection should be reversed.

Claim 39 also recites "0.1 to 20 wt.% of at least one (meth)acrylate compound different from a and b containing one or more acidic groups and comprising at least one methacrylate compound selected from the group consisting of phosphoric (meth)acrylate compounds and phosphonic (meth)acrylate compounds. As discussed with respect to claim 4, above, the '391 patent does not teach these acidic components. The '391 reference teaches against acidic adhesion promoters due to gelling problems. For the reasons set forth above regarding patentability of claim 4 over the '391 reference, incorporated herein by reference, Appellants submit that there is no teaching or suggestion in the '391 that would motivate one of skill in the art to modify the reference in an attempt to achieve Appellants' claim 39. The rejection should be reversed.

#### **Dependent claims 37 and 38**

Claims 37 and 38 depend from claim 36. To the extent that claim 36 is patentable, these claims are also patentable and the rejection should be reversed.

**Conclusion**

Appellant respectfully requests the Board to reverse the rejections of claims 1-7, 28 and 31-39 and to allow claims 1-7, 28 and 31-39. The U.S. Patent and Trademark Office is hereby authorized to charge any required fee associated with filing of this Appeal Brief and Request for Extension of Time to Deposit Account 12-2135. Please direct any inquiries regarding this filing to the undersigned.

Respectfully submitted,

/Mary K. Cameron/

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APPENDIX A -- CLAIMS

1. A coating material comprising:
  - a. 40 to 90 wt.% of at least one oligomeric substance selected from the group consisting of epoxy (meth)acrylates, polyester (meth)acrylates, polyether (meth)acrylates, and polyurethane (meth)acrylates, wherein said oligomeric substance is linear or branched and contains at least two unsaturated double bonds;
  - b. 5 to 60 wt.% of at least one low molecular weight (meth)acrylate selected from the group consisting of monofunctional, difunctional, trifunctional and polyfunctional (meth)acrylate compounds;
  - c. 0.1 to 20 wt.% of at least one (meth)acrylate compound different from a and b containing one or more acidic groups; and
  - d. 0.1 to 20 wt.% of at least one auxiliary substance selected from the group consisting of adhesion promoters different from c, flow-control agents, defoaming agents, light stabilizers, dyes, pigments, biocides, fillers and photoinitiators;wherein 2.0 to 9.7 wt.%, based upon total coating material, of the at least one low molecular weight (meth)acrylate is selected from difunctional, trifunctional and polyfunctional (meth)acrylate compounds.
2. A coating material according to claim 1 wherein a, b, c, and d are selected and homogenized together such that the coating material has a viscosity within a temperature range of 15°C to 70°C of less than 300 mPas.
3. A coating material according to claim 1 additionally comprising up to 20 wt.% of at least one silane selected from the group consisting of dialkoxysilanes and trialkoxysilanes wherein said at least one silane contains at least one functional group other than alkoxy groups.
4. A coating material according to claim 1, wherein component c) comprises at least one



methacrylate compound selected from the group consisting of phosphoric (meth)acrylate compounds and phosphonic (meth)acrylate compounds.

5. A coating material according to claim 1 comprising at least one dye or pigment.
6. A coating material according to claim 1 comprising at least one biocide.
7. A coating material according to claim 1 comprising at least one pigment selected from the group consisting of highly disperse silica and highly disperse aluminum oxide.

28. A coating material comprising:

- a. 45 to 85 wt.% of at least one oligomeric substance having at least two unsaturated double bonds selected from the group consisting of epoxy (meth)acrylates, polyester (meth)acrylates, polyether (meth)acrylates, and polyurethane (meth)acrylates, wherein said oligomeric substance is linear or branched;
- b. 10 to 60 wt.% of at least one (meth)acrylate selected from the group consisting of monofunctional, difunctional, trifunctional and polyfunctional (meth)acrylate compounds;
- c. 0.5 to 10 wt.% of at least one (meth)acrylate compound containing one or more phosphoric or carboxyl acidic functional groups;
- d. 0.5 to 15 wt.% of at least one radical photoinitiator; and
- e. up to 20 wt.% of at least one silane selected from the group consisting of dialkoxysilanes and trialkoxysilanes wherein said at least one silane contains at least one functional group other than alkoxy groups;

wherein 2.0 to 9.7 wt.%, based upon total coating material, of the at least one low molecular weight (meth)acrylate is selected from difunctional, trifunctional and polyfunctional (meth)acrylate compounds.

31. A coating material according to claim 28, wherein component c) comprises at least one methacrylate compound selected from the group consisting of phosphoric (meth)acrylate

compounds and phosphonic (meth)acrylate compounds.

32. A coating material according to claim 28 additionally comprising up to 20 wt.% of at least one silane selected from the group consisting of dialkoxysilanes and trialkoxysilanes wherein said at least one silane contains at least one functional group other than alkoxy groups.
33. A coating material according to claim 28 comprising at least one pigment selected from the group consisting of highly disperse aluminum oxide, titanium oxide and barium sulfate.
34. A coating material according to claim 33 wherein said pigment is white, colorless or transparent.
35. A coating material according to claim 28 comprising at least one antibacterial or biocidal component.
36. A high-energy radiation curable coating material for metal surfaces comprising:
  - a. 40 to 90 wt.% of a component of at least one oligomeric substance selected from aromatic epoxy (meth)acrylates, said at least one oligomeric substance optionally including at least one of polyester (meth)acrylates, polyether (meth)acrylates, and polyurethane (meth)acrylates, wherein said oligomeric substance contains at least two unsaturated double bonds;
  - b. 5 to 60 wt.% of a component of at least one low molecular weight (meth)acrylate selected from the group consisting of monofunctional, difunctional, trifunctional and polyfunctional (meth)acrylate compounds different from a;
  - c. 0.1 to 20 wt.% of a component of at least one (meth)acrylate compound different from a and b containing one or more acidic groups; and
  - d. 0.1 to 20 wt.% of a component of at least one auxiliary substance selected from the group consisting of adhesion promoters, flow-control agents, defoaming agents, light stabilizers, dyes, pigments, biocides, fillers and photoinitiators;wherein said components are selected and homogenized such that the coating material

has a viscosity of less than 1000 mPas within a temperature range of 0 to 90°C and the coating material deposited on metal surfaces cross-links to become a formable surface coating upon curing.

37. A coating material according to claim 36, wherein component a) comprises 34.3 to 80.8 wt.%, based on total coating material, of aromatic epoxy (meth)acrylates.
38. A coating material according to claim 36, wherein component b) comprises 2.0 to 9.7 wt.%, based upon total coating material, of difunctional, trifunctional and polyfunctional (meth)acrylate compounds.
39. A coating material comprising:
- a. 40 to 90 wt.% of at least one oligomeric substance selected from the group consisting of epoxy (meth)acrylates, polyester (meth)acrylates, polyether (meth)acrylates, and polyurethane (meth)acrylates, wherein said oligomeric substance is linear or branched and contains at least two unsaturated double bonds;
  - b. 5 to 60 wt.% of at least one low molecular weight (meth)acrylate selected from the group consisting of monofunctional, difunctional, trifunctional and polyfunctional (meth)acrylate compounds;
  - c. 0.1 to 20 wt.% of at least one (meth)acrylate compound different from a and b containing one or more acidic groups and comprising at least one methacrylate compound selected from the group consisting of phosphoric (meth)acrylate compounds and phosphonic (meth)acrylate compounds; and
  - d. 0.1 to 20 wt.% of at least one auxiliary substance selected from the group consisting of adhesion promoters different from c, flow-control agents, defoaming agents, light stabilizers, dyes, pigments, biocides, fillers and photoinitiators;
- wherein 2.0 to 15.4 wt.%, based upon total coating material, of the at least one low molecular weight (meth)acrylate is selected from difunctional, trifunctional and polyfunctional (meth)acrylate compounds.

**APPENDIX B -- EVIDENCE**

Portions of reference publications referred to in this Brief are attached hereto as required by MPEP 1205.02

No additional evidence pursuant to §§ 1.130, 1.131, or 1.132 or entered by or relied upon by the examiner is being submitted herewith.

US Patent No. 4,642,362: "In addition to reaction with acid halides, **(meth)acryl**calixarenes may be prepared by reaction of calixarene hydroxyl groups with isocyanato functional **(meth)acrylate** compounds, such as isocyanatoethyl **methacrylate** or **acrylate**, or by the two step reaction with diisocyanates and hydroxy functional **(meth)acrylates**." (Column 5, line 53)

US Patent No. 4,952,711: "The term "**(meth)acryl**" is used generally to refer to both **acryl** and **methacryl** functional groups." (Column 1, line 20)

US Patent No. 5,516,812: "In the present composition said at least one **(meth)acryl**-functionalized silicone has at least one **acryl** or **methacryl** a functional group and at least one hydrolyzable group .... Preferred functionalized silicones are the **methacryloxy** or **acryloxy** alkyl or **methacryloxy** or **acryloxy** alkenyl functionalized silicones. Suitable **(meth)acryl**-functionalized silicones for use in the present invention include... **methacryloxypropyl**-dimethoxysilyl terminated silicone, **acryloxypropyldimethoxysilyl** terminated silicone or a mixture thereof." (Column 8, line 53)

US Patent No. 6,350,790: "Suitable examples of monomer diluents also include, but are not limited to, aromatic-containing monomers such as phenoxyalkyl **acrylates** or **methacrylates** (e.g., phenoxyethyl**(meth)acrylate**); phenoxyalkyl alkoxylate **acrylates** or **methacrylates** (e.g., phenoxyethyl ethoxylate **(meth)acrylate** or phenoxyethyl propoxylate**(meth)acrylate**);" (Column 11, line 23)

US Patent No. 6,467,897: "The term "**(meth)acryl**", as used herein, encompasses **acryl** and/or **methacryl**." (Column 16, line 32)

US Patent No. 6,627,672: "For purposes of this invention, the term **(meth)acryl** or **(meth)acrylate** will refer to both **methacrylate** and **acrylate** species." (Column 2, line 65)

US Patent No. 7,067,601: "As stated above, monofunctional **(meth)acrylate** esters (esters containing one **(meth)acrylate** group) also may be included in compositions of the present invention. Examples of useful monofunctional **acrylates** include cyclohexyl **methacrylate**, tetrahydrofurfuryl **methacrylate**, hydroxyethyl **acrylate**, hydroxypropyl **methacrylate**, t-butylaminoethyl **methacrylate**, cyanoethyl **acrylate**, chloroethyl **methacrylate** and m-butoxyethyl **methacrylate**." (Column 3, line 15)

US Patent No. 7,408,012: "For purposes of the present invention, the terms **(meth)acrylate** and **(meth)acrylic** are used synonymously with regard to the monomer and monomer-containing component, and these terms include **acrylate**, **methacrylate**, **acrylic**, and **methacrylic**." (Column 4, line 3)

US Patent No. 7,429,633: "**(Meth)acrylic** means **methacrylic** or **acrylic**, and in the case of acrylic the methyl in formula (3) is a hydrogen." (Column 5, line 61)

**APPENDIX C -- RELATED PROCEEDINGS**

No related proceedings are referenced, hence no Appendix is included.

# WHITTINGTON'S DICTIONARY OF PLASTICS

*by*

Lloyd R. Whittington



Sponsored by the SOCIETY OF PLASTICS ENGINEERS, INC.

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# Appendix B

**Acid-Acceptor.** A compound which acts as a stabilizer by chemically combining with acid which may be initially present in minute quantities in a plastic, or which may be formed by the decomposition of the resin. See also STABILIZER.

**Acid Number.** See ACID VALUE.

**Acidolysis.** The process of reacting an acid with an ester. See also ESTER EXCHANGE.

**Acid Resistance.** The ability of a plastics material to withstand attack by an acid. Most plastics have a high degree of acid resistance.

**Acid Value.** The measure of free acid content of a substance. It is expressed as the number of milligrams of KOH neutralized by the free acid present in one gram of the substance. This value, also called *acid number*, is sometimes used in connection with the end-group method of determining the molecular weight of polyesters. It is also used in evaluating plasticizers, in which acid values should be as low as possible.

**Acrolein.**  $\text{CH}_2\text{CHCHO}$ . (acrylic aldehyde, propenal, allyl aldehyde, acraldehyde). A liquid derived from the oxidation of allyl alcohol or propylene, used as an intermediate in the production of polyester resins and polyurethanes.

**Acrylamide.**  $\text{CH}_2\text{CHCONH}_2$ . A crystalline solid at room temperature, capable of polymerization or copolymerization.

**Acrylate Resins.** See ACRYLIC RESINS.

**Acrylic Acid.**  $\text{CH}_2\text{CHCOOH}$ . (acroleic acid, ethylenecarboxylic acid, vinylformic acid, propenoic acid). A colorless unsaturated acid which polymerizes readily, used in the production of acrylic resins.

**Acrylic Aldehyde.** See ACROLEIN.

**Acrylic Ester.** (acryl ester). An ester of acrylic acid or of a structural derivative of acrylic acid. These esters are readily polymerizable liquid monomers. See also ACRYLIC RESINS.

**Acrylic Fiber.** Generic name for a manufactured fiber in which the fiber-forming material is any long chain synthetic polymer composed of at least 85% by weight of acrylonitrile units  $-\text{CH}_2\text{CH}(\text{CN})-$ . (Federal Trade Commission).

**Acrylic Resins.** Polymers of acrylic or methacrylic esters, sometimes modified with non-acrylic monomers such as the ABS group. The acrylates may be methyl, ethyl, butyl or 2-ethylhexyl. Usual methacrylates are the methyl, ethyl, butyl, lauryl and stearyl. The resins may be in the form of molding powders or casting syrups, and are noted for their exceptional clarity and optional properties. Acrylics are widely used in lighting fixtures because they are slow burning or may be made self-extinguishing, and do not produce harmful smoke or gases in the presence of flame.



# Appendix B

Metallic

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Methanol

**Metallic Soaps.** See SOAPS, METALLIC.

**Metallizing.** A term covering all processes by which plastics are coated with metal. The most commonly used processes are described under ELECTROPLATING, VACUUM METALLIZING and SILVER SPRAY PROCESS. Other methods are spraying with metallic pigments, chemical reduction, gas plating and vapor pyrolysis.

**Metamerism.** The phenomenon exhibited by two surfaces which appear to be of the same color when viewed under one light source (e.g. daylight), but which do not match in color when viewed under a different light source (e.g. incandescent lamp). The term *geometric metamerism* has been proposed for a change in appearance of a colored surface when the viewing angle is changed.

**Metastable.** (adj.). An unstable condition of a plastic evidenced by changes of physical properties not caused by changes in composition or in environment. Note: Metastable refers, for example, to the temporarily more flexible condition of some plastics after molding. No physical tests should be made while the plastic is in a metastable condition unless data regarding this condition are desired. (ASTM D 883-65T).

**Metering Screw.** An extrusion screw which has a shallow constant depth, and constant pitch section over, usually, the last three to four flights. The function of the metering zone is to control the pressure and temperature of the plastic melt.

**Metering Zone.** The final zone of an extruder barrel, in which the melt is advanced at a uniform rate to the breaker plate or die.

**Methacrylate Esters.** Esters of methacrylic acid having the formula  $\text{CH}_2\text{C}(\text{CH}_3)\text{COOR}$ , wherein R is usually methyl, ethyl, isobutyl or n-butyl-octyl. They are polymerizable to acrylic resins.

**Methacrylate Plastics.** See ACRYLIC PLASTICS.

**Methacrylic Acid.**  $\text{CH}_2\text{C}(\text{CH}_3)\text{COOH}$ . (alpha-methacrylic acid). A colorless liquid monomer used in the production of many types of acrylic resins.

**Methacrylonitrile.** (MAN, alpha methyl acrylonitrile). A recently developed vinyl monomer containing the nitrile group. Its homopolymers are true thermoplastics with good-mechanical strength and high resistance to solvents, acids and alkalis. Modified properties can be obtained through blending, grafting, or copolymerization with other monomers. MAN is also used as a replacement for acrylonitrile in the preparation of nitrile elastomers.

$$\text{CH}_3\text{O}$$
  
**gamma-Methacryloxypropyltrimethoxy Silane.**  $\text{CH}_2=\text{C}(\text{CH}_3)-\text{C}(\text{O})(\text{CH}_2)_3\text{Si}(\text{OCH}_3)_3$ . A silane coupling agent used in reinforced polyesters, epoxies, and many thermoplastics.

**Methanol.** See FORMALDEHYDE.

**Methanol.** See METHYL ALCOHOL.

# Appendix B

*Hawley's*

*Condensed Chemical*

*Dictionary*

*TWELFTH EDITION*

*Revised by*

Richard J. Lewis, Sr.



VAN NOSTRAND REINHOLD COMPANY

New York

# Appendix B

Use: Modacrylic fibers; blankets; carpets.  
See also modacrylic fiber; acrylic resin.

acrylic polymers. See acrylic resin.

acrylic resin. (acrylic fiber; nitrile rubber).

Thermoplastic polymers or copolymers of acrylic acid, methacrylic acid, esters of these acids, or acrylonitrile. The monomers are colorless liquids that polymerize readily in the presence of light, heat, or catalysts such as benzoyl peroxide; they must be stored or shipped with inhibitors present to avoid spontaneous and explosive polymerization.

See also acrylic acid, acrylonitrile, methyl methacrylate.

Properties: Acrylic resins vary from hard, brittle solids to fibrous, elastomeric structures to viscous liquids, depending on the monomer used and the method of polymerization. A distinctive property of cast sheet and extruded rods of acrylic resin is ability to transmit light.

Use: Bulk-polymerized: Hard, shatterproof, transparent or colored material (glass substitute, decorative illuminated signs, contact lenses, dentures, medical instruments, specimen preservation, furniture components). Suspension-polymerized: beads and molding powders (headlight lenses, adsorbents in chromatography, ion-exchange resins). Solution polymers: coatings for paper, textiles, wood, etc. Aqueous emulsions: adhesives, laminated structures, fabric coatings, nonwoven fabrics. Compounded prepolymers: exterior auto paints, applied by spray and baked. Acrylonitrile-derived acrylics are extruded into synthetic fibers and are also the basis of the nitrile family of synthetic elastomers.

See also acrylic acid, acrylonitrile, methyl methacrylate.

"Acryloid" Coating Resins [Rohm & Haas].

TM for acrylic ester polymers in organic solvent solutions or 100% solid forms; water-white and transparent. Films range from very hard to very soft.

Use: Exceptionally resistant surface coatings, such as heat-resistant and flameproof enamels; vinyl and plastic printing; fluorescent coatings; clear and pigmented coatings on metals.

"Acryloid" Modifiers [Rohm & Haas]. TM for

thermoplastic acrylic polymers in powder form. Various grades facilitate processing or improve physical properties of rigid or semi-rigid polyvinyl chloride formulations.

"Acryloid" Oil Additives [Rohm & Haas]. TM

for acrylic polymers supplied in special oil solution or in diester lubricant.

Use: Viscosity-index improvement; pour-point

depression of lubricating oils and hydraulic fluids; sludge dispersancy in lubricating and fuel oils.

"Acrylon" [Borden]. TM for a group of acrylic rubbers outstanding in resistance to oil, grease, ozone, and oxidation.

Use: Gaskets and rubber parts for contact with oils and diester lubricants.

acrylonitrile. (propenenitrile; vinyl cyanide).

CAS: 107-13-1.  $H_2C=CHCN$ . 39th highest-volume chemical produced in U.S. (1991).

Properties: Colorless, mobile liquid; mild odor; fp  $-83^\circ C$ ; bp  $77.3-77.4^\circ C$ ; d 0.8004 (25°C); flash p 32°F (0°C) (TÖC). Soluble in all common organic solvents; partially miscible with water.

Derivation: (1) From propylene oxygen and ammonia with either bismuth phosphonolylbdate or a uranium-based compounds as catalysts; (2) addition of hydrogen cyanide to acetylene with cuprous chloride catalyst; (3) dehydration of ethylene cyano-hydrin.

Hazard: Toxic by inhalation and skin absorption. A carcinogen. Flammable, dangerous fire risk. Explosive limits in air 3 to 17% TLV: 2 ppm, suspect of carcinogenic potential for humans.

Use: Monomer for acrylic and modacrylic fibers and high-strength whiskers; ABS and acrylonitrile styrene copolymers; nitrile rubber; cyanoethylation of cotton; synthetic soil blocks (acrylonitrile polymerized in wood pulp); organic synthesis; adiponitrile; grain fumigant; monomer for a semiconductive polymer that can be used like inorganic oxide catalysts in dehydrogenation of tert-butanol to isobutylene and water.

acrylonitrile-butadiene rubber. See nitrile rubber.

acrylonitrile-butadiene-styrene resin. Most contemporary ABS resins are true graft polymers consisting of an elastomeric polybutadiene or rubber phase, grafted with styrene and acrylonitrile monomers for compatibility, dispersed in a rigid styrene-acrylonitrile (SAN) matrix. Mechanical polyblends of elastomeric and rigid copolymers, e.g., butadiene-acrylonitrile rubber and SAN, historically the first ABS resins, are also marketed.

Varying the composition of the polymer by changing the ratios of the three monomers and use of other comonomers and additives results in ABS resins with a wide range of properties.

Properties: Dimensional stability over temperature range from  $-40$  to  $+71^\circ C$ . Attacked by nitric and sulfuric acids, and by aldehydes, ketones, esters, and chlorinated hydrocarbons. Insoluble in alcohols, aliphatic hydrocarbons, and mineral and vegetable oils. Processed by conventional molding and extrusion methods; D 1.04; tensile strength about 6500 psi; flexural

# Appendix B

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## METHYACRYLIC ACID

**metapon.** (methylidihydromorphine). A narcotic drug.  
See also narcotic.

**"Metasol" [Merck].** TM for a series of chemicals used as fungicides, mildewicides, bactericides, slime control agents for pulp and paper mill systems, and as preservatives for all types of systems. Type (J-26) is claimed to be a broad-spectrum antimicrobial agent with a minimum ecological hazard.

**"Meta-Systox R" [Mobay].** TM for O,O-dimethyl-S-2-(ethylsulfinyl)ethyl phosphorothioate.

**metathesis.** See double decomposition.

**"Metazene" [Pestco].** TM for odorless odor counteractant additive for formulating.

**metepa.** (generic name for tris(methyl-1-aziridinyl)phosphine oxide). CAS: 57-39-6.  $(C_2H_5N)_3PO$ .

Properties: Amber liquid, amine odor, bp 188°C at 1 mm Hg, d 1.079, miscible with water and organic solvents.

Hazard: Toxic by ingestion and skin absorption, strong irritant to skin.

Use: Insect chemosterilant, addition products for textile treatments, adhesives, paper and rubber processing, cross-linking agent in polymer systems which contain active hydrogens, monomer.

**meter.** (1) The basic unit of length of the metric system (39.37 in.). Originally defined as one ten-millionth of the distance from the equator to the North Pole. Now defined as 1,650,763.73 wavelengths of the orange-red line of the isotope krypton-86. (2) A device for measuring the flow rate of liquids, gases, or particulate solids, e.g., flowmeters, rotameters, proportioning equipment.

See also gauge.

**"Metglas" [Allied-Signal].** TM for an amorphous metal alloy developed for use as transformer coils.

**"Methac" [Borden].** TM for a series of blends of methyl acetate with methanol in varying proportions.

Hazard: Toxic by ingestion.

Use: Lacquer solvents, paint removers, organic synthesis.

**methacrolein.** (methacrylaldehyde).

CAS: 78-85-3.  $CH_2=C(CH_3)CHO$ .

Properties: Liquid, d 0.8474 (20/20°C), bp 68.0°C, flash p 35F (1.7°C) (OC), soluble in water (20°C)

5.9% by wt, shipped with 0.1% hydroquinone as polymerization inhibitor.

Hazard: Flammable, dangerous fire risk. Strong irritant.

Use: Copolymers, resins.

**methacrylaldehyde.** See methacrolein.

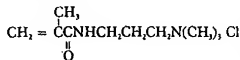
**methacrylamide.** (methacrylic acid amide).

CAS: 79-39-0.  $CH_2=C(CH_3)CONH_2$ .

Properties: Solid, mp 110°C.

Use: A monomer for acrylic resins.

**methacrylamidopropyltrimethylammonium chloride.** (MAPTAC).



Properties: (50% water solution): Amber liquid, d 1.059, refr index 1.427, flash p (CC) none, bulk d 8.66 lb/gal.

Use: Reactive cationic monomer for wide range of industrially useful polymers.

**methacrylate ester.**  $CH_2=C(CH_3)COOR$ , where R is usually methyl, ethyl, isobutyl, or n-butyl-isobutyl (50-50). Esters of methacrylic acid; supplied commercially as the polymers.

See acrylic resin.

**methacrylate resin.** See acrylic resin.

**methacrylateochromic chloride.**



Properties: Water-soluble solid.

Derivation: Reaction of methacrylic acid with basic chromic chloride.

Use: Water repellent, nonadhesive, insolubilizer for vinyl polymer.

See "Volan" [DuPont].

**methacrylic acid.** ( $\alpha$ -methacrylic acid) (monomer). CAS: 79-41-4.  $H_2C=C(CH_3)COOH$ .



Properties: Colorless liquid, mp 15-16°C, bp 161-162°C, d 1.015 (20°C), flash p 170F (76.6°C). Soluble in water, alcohol, ether, most organic solvents. Polymerizes readily to give water-soluble polymers. Combustible.

Derivation: Reaction of acetone cyanohydrin and dilute sulfuric acid; oxidation of isobutylene.

Grade: 40% aqueous solution, bp 76-78°C (25

# Appendix B

## $\alpha$ -METHACRYLIC ACID

750

mm Hg), crude monomer 85% pure, glacial (99% assay).

Hazard: Toxic material. Strong irritant to skin. TLV: 20 ppm.

Use: Monomer for large-volume resins and polymers, organic synthesis. Many of the polymers are based on esters of the acid, as the methyl, butyl, or isobutyl esters.

See acrylic resin.

$\alpha$ -methacrylic acid. See methacrylic acid.

$\beta$ -methacrylic acid. See crotonic acid.

methacrylonitrile. (2-cyanopropene-1; isopropenenitrile). CAS: 126-98-7.

$\text{CH}_2=\text{C}(\text{CH}_3)\text{C}\equiv\text{N}$ .

Properties: Clear, colorless liquid. Bp 90.3°C, fp -38.8°C, flash p 55F (12.7°C) (TOC), d 0.789, slightly soluble in water, soluble in acetone, thermoplastic, resistant to acids and alkalis.

Hazard: Flammable. Toxic by ingestion, inhalation, and skin absorption. TLV: 1 ppm.

Use: Vinyl nitrile monomer, copolymer with styrene, butadiene, etc., elastomers, coatings, plastics.

$\gamma$ -methacryloxypropyltrimethoxysilane.

$\text{CH}_2=\text{C}(\text{CH}_3)\text{COOCH}_2\text{CH}_2\text{CH}_2\text{Si}(\text{OCH}_3)_3$ .

Properties: Liquid, d 1.045 (25°C), bp approximately 80°C (1 mm Hg), refr index 1.4285 (25°C), flash p 135F (57.2°C). Soluble in acetone, benzene, ether, methanol, and hydrocarbons. Combustible.

Grade: 97% min purity.

Hazard: Moderate fire risk.

Use: Coupling agent for promotion of resin-glass, resin-metal, and resin-resin bonds, for formulation of adhesives having "built-in" primer systems.

methacryloyl chloride. CAS: 920-46-7.

$\text{H}_2\text{C}=\text{C}(\text{CH}_3)\text{COCl}$ .

Properties: Liquid with mw 104.54, bp 95 - 96°C, d 1.070, fp 2°C.

Available forms: Technical 90% stabilized with phenothiazine.

Hazard: Flammable and corrosive liquid.

methadone hydrochloride. (dl-6-dimethylamino-4,4-diphenyl-3-heptanonehydrochloride).

CAS: 1095-90-5.

$(\text{C}_6\text{H}_5)_2\text{C}(\text{COOC}_2\text{H}_5)\text{CH}_2\text{CH}(\text{CH}_3)\text{N}(\text{CH}_3)_2\cdot\text{HCl}$ . A synthetic narcotic.

Properties: Crystalline substance with a bitter taste; no odor; mp 232-235°C; soluble in water, alcohol, and chloroform; practically insoluble in ether and glycerol; pH (1% aqueous solution) 4.5-6.5.

Grade: USP.

Hazard: Toxic. Addictive narcotic. Use restricted.

Use: Medicine (sedative, treating heroin addiction).

methallenestriol. ( $\beta$ -ethyl-6-methoxy- $\alpha,\alpha$ -dimethyl-2-naphthaleneopropionic acid).

CAS: 517-18-0.

$\text{CH}_3\text{OC}_6\text{H}_4\text{CH}_2\text{CH}(\text{C}_2\text{H}_5)\text{C}(\text{CH}_3)_2\text{COOH}$ .

Properties: Crystals, mp 132.5°C, soluble in ether, vegetable oils.

Use: Medicine (estrogen).

methallyl acetate. See methylallyl acetate.

methallyl alcohol. See methylallyl alcohol.

$\beta$ -methallyl chloride. See  $\beta$ -methylallyl chloride.

methallylidene diacetate.

$\text{CH}_2=\text{C}(\text{CH}_3)\text{CH}(\text{OCOCH}_3)_2$ .

Properties: Liquid, d 1.510 (20/20°C), bp 191.0°C, fp -15.4°C, flash p 215F (101°C) (COC), slightly soluble in water. Combustible.

Use: Chemical intermediate, can provide controlled release of methacrolein in acid solution.

methamidophos. (O,S-dimethyl phosphor-amidothioate). CAS: 10265-92-6.

Properties: Mp 39-41°C, water-miscible.

Use: Insecticide for cotton, cole crops, lettuce, potatoes.

methamphetaminehydrochloride. See amphetamine.

methanal. See formaldehyde.

methanamide. See formamide.

methanation. A reaction by which methane is formed from the hydrogen and carbon monoxide derived from coal gasification. It requires a catalyst, e.g., nickel, and temperatures in the range of 500°C. In one process the reaction is performed in an adiabatic fixed-bed reactor. The reaction is  $3\text{H}_2 + \text{CO} \rightarrow \text{CH}_4 + \text{water}$ .

See also gasification.

methane. (marsh gas; methyl hydride).

CAS: 74-82-8.  $\text{CH}_4$ . The first member of the paraffin (alkane) hydrocarbon series.

Properties: Colorless, odorless, tasteless gas; lighter than air; practically inert toward sulfuric acid, nitric acid, alkalies, and salts but reacts with chlorine and bromine in light (explosively in direct sunlight); flash p -306F (-188°C); bp -161.6°C; fp -182.5°C; autoign temp 1000F (537°C); vap d 0.554 (0°C); critical temperature -82.1°C; critical pressure 672 psia; heating value

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Hazard: Sev

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Use: Source

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methanesulfur

$\text{CH}_3\text{SO}_2\text{H}$ .

Properties: L

(18/4°C), mp

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none.

Grade: 70%.

Hazard: Corr

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Use: Cataly

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CAS: 124-63-

Properties: Pt

bp 164°C, fp

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Grade: 98%,

Use: Intermed

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